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RESPONSES TO NOVEMBER 29, 1988
CDH LETTER ON THE CLOSURE PLAN
FOR THE SOLAR EVAPORATION PONDS

INTRODUCTION

The following responses are provided in the order discussed in the Colorado Department of Health (CDH) letter of November 29, 1988. CDH reviewed the Solar Evaporation Ponds closure plan of July 1, 1988, with the comments restated below. Following each comment is a written response.

COMMENT #1

According to Section 1.2.1, extensive modifications and renovations were performed on the Solar Ponds during the 1960's and 1970's. These renovations included both liner repair and replacement. Explain where the liquids, sludges and old liner materials were disposed of when various ponds, such as Pond 207-B South and Center, were relined.

RESPONSE TO COMMENT #1

Pond modifications have been made since the original construction in the 1950's because of cracking and slumping of the existing linings and leakage of the pond contents. During pond modifications, all liquids from the affected ponds were transferred to alternate ponds for temporary storage until repairs or modifications were completed.

Based on interviews with Rockwell employees, the sludges remaining in the ponds after transfer of the liquids were disposed off-site. Rockwell is unaware of any records that would indicate the off-site location for final disposal.

Removal, treatment and disposal of sludges from Pond 207-A began in 1985. Pond-crete is the solid material resulting from combining the pond sludge with portland cement and calcium chloride. The pond-crete was placed in containers for solidification, temporary on-site storage, and subsequent transport.

Based on Rockwell employee interviews, the removed linings were bagged, cemented, and disposed off-site. There are not records to indicate the off-site disposal location. However, based on further research, it is noted that contaminated planks from the solar ponds were disposed in Trenches T-4 through T-11 (SWMU 111) (CEARP Phase 1: Draft Installation Assessment Rocky Flats Plant). However, most of the linings were upgraded by overlaying the previous lining, thus avoiding removal and disposal.

The original pond that was constructed in the 1950s near the present location of Pond 207-C was lined with four inches of clay. After this pond was drained and sludges removed for disposal, the remaining berms and soil liner were regraded for construction of the existing Pond 207-C, which was placed in service in 1970. Pond 207-C was constructed to provide additional storage capacity and to enable the transfer and storage of liquids from the other ponds in order to simplify performing repair work on them. The liner of Pond 207-C consists of a multi-layered asphalt section of alternating seal coats and asphaltic concrete on a four-inch aggregate base course, overlying the prepared subgrade.

COMMENT #2

The maximum operating volume for Pond 207-A is given as approximately 5.1 million gallons. Calculations for this value are referred to in Appendix 2. However, the table of volume calculations shown in Appendix 2 indicates a maximum volume for Pond 207-A of approximately 5.7 million gallons. Similarly, the operating volume of Pond 207-C is estimated at 1.3 million gallons, while Appendix 2 shows a calculated volume of 1.2 million gallons. Explain the discrepancies.

RESPONSE TO COMMENT #2

The volume calculations given in Appendix 2 are total volumes based on calculations obtained from plan dimensions. These volumes included consideration for two feet of freeboard. These are considered "ideal" volumes.

Table I "operating" volumes are maximum capacity estimates by Rockwell. The volumes indicate reduced liquid volumes which account for sediments and sludges that have accumulated in the bottoms of the ponds. Estimated sediment volumes are also listed.

COMMENT #3a

Section 1.3.2.2 states that "Plutonium-239 and Americium-241 were not identified in the Pond 207-B North liquid in April and May, 1986." However, the analytical report for Pond 207-B North, dated August 27, 1985, and found in Appendix 3, indicates Pu-239 levels of 71.2 pCi/l and Am-241 levels of 57.6 pCi/l. Likewise, the analysis dated June 5, 1984, shows Pu-239 levels of 30 pCi/l and Am-241 levels of 97 pCi/l for Pond 207-B North. Explain the large variation in these radionuclide levels over the relatively short time period from June, 1984 to April, 1986.

RESPONSE TO COMMENT #3a

The decrease in concentration appears to be the result of termination of operation in the west spray field and the resulting accumulation of water in Pond 207-B North from the interceptor trench pump house resulting in dilution.

During this period, there also was considerable transfer of liquids between the 207-B ponds in order to accommodate water from the interceptor trench pump house and reverse osmosis treatment facility, in addition to the need for increased storage allocation due to termination of spraying in the west spray field. The exact sequence of liquid transfer between June, 1984 and April, 1986, is not available. The variation in parameter concentrations is not unreasonable considering the available data on operating history.

COMMENT #3b

Page 32 indicates that Ponds 207-B North and Center "have generally low concentrations of nitrates, metals and radionuclides." The nitrate concentration average of 380 mg/l and the gross alpha average of 104 pCi/l are lower than Pond 207-A, but are still elevated in comparison to the Colorado drinking water standard for nitrate (10 mg/l) and the Colorado screening level of 15 pCi/l for gross alpha in water. Explain how these values can be considered "low."

RESPONSE TO COMMENT 3b

The adjective "low" is relative to the nitrate concentration in Pond 207-A. The adjective will be removed from the revised closure plan and only the data will be referenced.

COMMENT #4

According to page 48, "Compliance with the Resource Conservation and Recovery Act (RCRA), with respect to solar pond closure, will be achieved by meeting 6 CCR 1007-3, Section 265.228 and Section 264 Subpart F." Compliance with Section 265, Subpart G and Section 264 is also required for solar pond closure in place as a landfill. Similarly, Section 4.1, page 115 also requires compliance with these regulations.

RESPONSE TO COMMENT #4

It is agreed that the solar pond closure must also comply with 6 CCR 1007, Section 265, Subpart G and Section 264. Page 48 and Section 4.1 of the closure plan will be revised to reflect compliance with these regulations.

COMMENT #5

The Summary of Solar Pond Closure Activities, presented in Figure 10 on page 49, is based on the resumption of pond-creting activities by the end of July, 1988. Page 50 states that schedules will be revised within 30 days if problems are identified and the schedule cannot be met. The current pond-crete status must be indicated, and the schedule updated to reflect the delays in the pond-creting operations. Other schedules throughout the closure plan, must also be updated based on the revised pond-creting schedule.

RESPONSE TO COMMENT #5

The schedule for closure of the solar ponds is dependent on approval of the closure plan by CDH, and continuation of the pond-creting operations for sludge removal. Pond-creting operations were temporarily halted in May 1988 due to inadequate solidification of some mixes. Resumption of the pond-creting is dependent on resolving the solidification issue. Pond crete will be sent to the Nevada Test Site.

The solar pond schedule has been revised to indicate the length of time in months from both approval of the closure plan, and from resumption of the pond-creting operations (attached). Revised schedules for a risk assessment-based closure of the solar ponds is also included (see Responses to Comments 8 and 17).

COMMENT #6

What is the "non-toxic, non-radioactive dye," referred to in Section 2.2.6, which must be added to the solar ponds "to increase heat gain and thereby increase solar evaporation?" Explain the circumstances and conditions under which this dye must be used. The Material Safety Data Sheet (MSDS) for this dye should be included in the appendices to this closure plan.

RESPONSE TO COMMENT #6

The "non-toxic, non-radioactive dye" was considered as a possible means for enhancing the evaporation rate in the ponds. However, based on the schedule revisions that may be required to expedite liquid removal, liquid processing in the forced evaporator will be more effective. Therefore, the issue of using a dye will be deleted from the closure plan. Dyes have not been used to date in the ponds.

COMMENT #7

Sections 2.4.3.2 and 4.6 describe potential "sudden increases in airborne contamination due to excavation in localized highly contaminated areas." The health and safety plan must specifically address the prevention and reduction of air release of contaminated dust. Work cessation measures in anticipation of natural dissipation are not adequate protection for human health and the environment. The work plan for the site must be directed towards the prevention of, not the control of a release, and will require the use of dust suppressants such as wetting agents during excavation. These agents will be specified before use.

RESPONSE TO COMMENT #7

The Rocky Flats Plant Safety Plan addresses the issues concerning the potential for prevention and reduction of air released contaminated dust during field operations such as excavations and drilling. The final plans and specifications will emphasize contractor prevention of contaminant releases, including work plans for excavation methods and use of dust suppressants.

A site specific health and safety plan, or such health and safety procedures identified in the Rocky Flats Plant Operational Safety Analysis (OSA) procedure, covering liner and contaminated soil removal will be prepared and submitted to CDH for review at least two months prior to commencement of associated activities.

COMMENT #8

Sections 2.6.1, 2.6.1.2 and 2.6.1.3 indicate that the removal of pond liners and underlying soils are dependent on combined plutonium and americium activity. The decision level for removal is set at 20 pCi/gm for combined activity. This level is approximately 22 times the construction standard for plutonium in soil as established by the Colorado Department of Health (CDH)(0.9 pCi/gm). The CDH standard of 0.9 pCi/gm must be used as the decision level, and the "as low as reasonably achievable" or ALARA philosophy for surface radioactive contamination levels must be applied.

State your rationale in basing the soil and liner removal decision exclusively on plutonium and americium. Other solar pond contaminants such as strontium, cadmium, organics, etc. must be present at levels far above the Maximum Contaminant Level (MCL), thus predicting soil and/or liner removal.

RESPONSE TO COMMENT #8

The soil removal criteria is based on a combined plutonium and americium activity level of 20 pCi/gm for the reasons stated in the closure plan, Section 2.6.1.2. Closure with waste in place does not require more stringent cleanup criteria.

A proposal to revise the closure plan based on a risk assessment has been forwarded to CDH. This approach would result in soil remedial action which will be consistent with the CERCLA sites at RFP. This approach includes conducting a risk assessment to establish allowable soil concentrations that will be protective of both human health and the environment through routes of human exposure except the ground-water pathway. This pathway is not considered because ground-water corrective action will be implemented to achieve compliance with the ground-water protective standard at the compliance point.

COMMENT #9

Section 2.6.1.3 indicates that the lateral and vertical extent of soil contamination requiring capping have been evaluated and are discussed in Appendix 6. The contours or isopleths for constituents of concern in the solar pond area must be presented so as to rapidly identify the lateral and vertical extent of contamination. Approval of removal activities will be based on this information as it is gathered. Currently, isopleths based on the northeast trending nitrate "plume" which envelopes "all intermediate boreholes except SP 13-87" appear to best represent the extent of soil contamination.

RESPONSE TO COMMENT #9

The extent of soil contamination has been characterized as discussed in Appendix 6, and is included within the limits of the proposed cap. Nitrates were present in the solar ponds and are highly mobile in ground water. The nitrate "plume" is the result of ground-water contamination from the solar ponds, which caused residual soil contamination downgradient within the anticipated limits of the water table fluctuation. The closure plan specifies that ground-water contamination, which resulted in the northeast trending plume, will be remedied by a ground-water treatment program.

Nitrates are limited to 10 ppm in drinking water. Measured soil concentrations were generally less than 10 ppm. In any event, the ground-water protection standards, which are defined in Section E of the Post-Closure Care Permit application, will be met at the point of compliance.

Therefore, there is no justification for extending the cap beyond the proposed limits presented in the closure plan.

COMMENT #10

Appendix 6 (page 5-33) indicates that "it is likely that contamination at Well 17-86 has arisen from the solar ponds because of the inability of the French drain to capture all contaminated ground water existing at the solar ponds during periods of high precipitation." Data for Well 17-86 indicates that the nitrate level ranges from 145 to 540 mg/l, and the total dissolved solids (TDS) level exceeds 4000 mg/l. Both of these values exceed drinking water standards. Well 17-86 is downgradient (north) of the French drain system. Explain how the existing French drain system and the proposed interceptor drain will prevent the further migration of constituents from the solar ponds. How deep will the "toed-in" interceptor drain be constructed?

RESPONSE TO COMMENT #9

Overloading of the French drain has occurred during periods of heavy precipitation. During these periods, nitrate laden ground water from the solar ponds has migrated in the soil beyond the drain, resulting in the recorded contaminant concentration levels.

The final design of the interceptor drain will be dependent on further characterization of the overall drain performance, as discussed in Appendix 6, Section 1.2. After implementing these performance monitoring steps, final design will be initiated. The interceptor ditch will be keyed into bedrock; however, the final design of the interceptor trench will depend on the completed characterization studies of the subsurface profile and the results of the recommended performance monitoring. Modifications to the final design may occur as a result of construction observation.

COMMENT #11

Section 4.3.3 specifies a 24-inch compacted on-site soil layer located above the six-inch horizontal sand layer. The 24-inch soil layer must be placed in four six-inch lifts to achieve optimal design performance. Previous to the placement of the compacted soil layers, the underlying sand layer must be compacted in order to minimize soil infiltration into the sand layer. Equipment and procedures used in compaction of the various layers must be specified. Section 4.3.8 discusses fill placement and differential settlement within the solar ponds. The expected ten feet of fill in this area must be limited to one-foot lifts in order to ensure that the potential for differential settlement is minimized.

RESPONSE TO COMMENT #11

The 24-inch layer of compacted on-site soil will be placed in six-inch lifts in order to achieve improved compaction control. The six-inch sand layers will also be compacted to reduce the potential for soil infiltration.

Since performance specifications are provided, i.e., a specified percentage of Proctor density near optimum moisture content, the exact methods of compaction are not included. This allows the contractor flexibility to choose the best equipment for the particular application. If the quality control testing results in a deficient condition, the contractor is then obligated to correct any deficiencies without claiming added costs. Conversely, if the specifications include explicit methods for compaction, and deficient conditions are encountered, legitimate grounds exist for the contractor to claim extra costs for construction.

Compaction equipment and methods will be required to prevent degradation of lower cap materials and fill layers.

The regraded soils beneath the cap will be placed in maximum one-foot compacted lifts. As indicated in Section 4.3.8, the deepest fills are anticipated to be ten feet. The compaction in lifts will reduce the potential for differential settlements of the cap.

COMMENT #12

Explain how the topsoil surface of the landfill cap will be protected from erosion prior to the establishment of vegetation on the cap (page 130). Page 119 indicates that the "total cover area is approximately 670,000 square feet." This extent is based on the site characterization. Page 137, however, indicates that "the area requiring vegetation will consist of the 750,000 square feet cover." Are the cover material volume calculations on page 129 based on the correct surface area estimate?

RESPONSE TO COMMENT #12

The final cover will have slopes ranging from nearly level along the south boundary, to a maximum of 20 percent near the north boundary. The slopes are designed to control surface erosion for the vegetated cover.

The 12 inches of topsoil will consist of on-site soil mixed with 300 pounds per cubic yard of organic fertilizer. Prior to seeding, the upper six inches of the surface will be ripped, and two tons per acre of hay mulch will be crimped into the soil with a crimper disc.

The grass mixture was selected to include fast germinating types to control initial erosion. In addition, the hay mulch and organics mixed in with the soil will reduce initial erosion potential.

In the event of severe erosion, the 24 inches of compacted on-site soil beneath the topsoil fortifies erosion protection by virtue of its high compaction density and well-graded size.

Quarterly maintenance inspections will be conducted as specified in the part B Post-Closure Care Permit. During this inspection, the condition of the cap and vegetation will be observed. If erosion has occurred, corrective actions will be implemented, including refilling erosion channels in accordance with the approved cap design. If necessary, fiber or jute netting will be used in local areas where erosion is most pronounced.

The difference in the cover area of 670,000 square feet and the vegetation area of 750,000 square feet is due to the 5 horizontal to 1 vertical slope that transitions from the full cover thickness to the existing grade. The slopes extended beyond the protective limit of the full cover thickness and thus account for the increased area of vegetation. The material volume calculations on page 129 take into account the slope volumes. As noted, the material volumes may vary slightly depending on final design and construction.

COMMENT #13

The ground-water monitoring requirements for closure (Section 265) and post-closure (Section 264) must be evaluated and compared to the existing ground-water monitoring system at the solar ponds. The proposed ground-water monitoring plan must adequately address the comments and deficiencies noted by CDH in the Ground-Water Monitoring of Interim Status units letter, issued to the facility on July 19, 1988.

RESPONSE TO COMMENT #13

The ground-water monitoring at the solar ponds has been evaluated and is addressed in Section E of the Post-Closure Care Permit application, which was submitted to CDH for review on October 5, 1988. The comments and deficiencies noted by CDH in the Ground-Water Monitoring of Interim Status Units letter of July 19, 1988, are addressed.

COMMENT #14

The specific activities to be monitored and documented as complete by the independent Colorado-Registered Professional Engineer will be explicitly stated in the closure plan. CDH must be notified prior to these specific activities in order for a state inspector to also be present.

RESPONSE TO COMMENT #14

Activities requiring inspection by a registered professional engineer are summarized in Section 6.2 of the closure plan. Specific activities can be explicitly outlined only after completion of final design plans and specifications for closure. A detailed list of activities to be monitored and documented will be completed and submitted for CDH review and comment, along with the plans and specifications for final design. Rockwell notes that only a Registered Professional Engineer and not necessarily a Colorado-Registered Professional Engineer is required to monitor and document as complete the closure of the solar ponds.

COMMENT #15

Additional monitoring wells are needed to adequately delineate the extent of the subcropping sandstone, and the contamination plume within them. Besides the additional monitoring wells proposed by RFP in Appendix 6, the following wells are necessary:

A. A bedrock monitoring well located just south of borehole SP05-87. This well will monitor the ground water downgradient from pond 207-C in the subcropping sandstone. This location will also aid in establishing the extent of contaminant migration in the area.

B. A bedrock monitoring well located approximately 250 feet east of well 39-87. This well is to be completed in the sandstone subcropping at well 39-87 and will monitor the downgradient migration of contamination emanating from the 207-B ponds.

C. A bedrock monitoring well located in conjunction with the proposed new RFP alluvial well between pond 207-B center and existing alluvial well 29-86. This well will further characterize bedrock hydrogeology in the area to the east of the solar ponds, and also aid in establishing the extent of the easterly component of contamination extending from the 207-B ponds.

D. A bedrock and alluvial well pair located approximately 220 feet due north of well 30-86 and within the northeast-trending paleochannel.

E. A bedrock and alluvial well pair located approximately 200 feet due north of borehole SP10-87 within the north-trending paleochannel. This well and well #4 above are sited in order to better define the potential extent of contamination within the paleochannels.

Updated cross-sections based on the information obtained from these wells must also be provided to CDH.

RESPONSE TO COMMENT #15

Rockwell agrees the installation and sampling of these wells will better define the extent of contamination at the solar ponds. The wells will be installed in 1989, but we note that 1) the location of the PSZ will affect the actual location of the well called for in B) above; 2) the sandstone targeted for well completion must be defined for C) above; and 3) the alluvial wells called for in D) and E) above may be difficult, if not impossible, to install because of the insufficient colluvial thickness in this area.

COMMENT #16

Section 4.2.1 of Appendix 6 indicates that background soil levels are derived from samples obtained from the top one foot of soil west of the West Spray Field. However, subsurface and bedrock soils more than likely have a very different background composition than the surficial alluvial soils of the West Spray Field. Explain the validity of the contamination screening comparison for "background" surface soils vs. subsurface soils and bedrock. State your rationale for attributing a "variability factor" of three to naturally occurring metal levels, particularly chromium and nickel, in the solar pond area.

RESPONSE TO COMMENT #16

We agree to the inadequacy of the data upon which background soil characterization is based. Rockwell is currently implementing a background characterization plan that calls for sampling and analysis of alluvial, colluvial, and Arapahoe Formation claystone and sandstones in background regions of the plant site. The data will be used to establish statistical tolerance intervals for constituent concentrations in soils that can be used to determine if a constituent concentration in soils at the Solar Ponds represents contamination. This will obviate the need to use a variability factor of three to establish a background range. The factor of three was chosen as a reasonable estimate of geochemical variability.

COMMENT #17

Chromium was found in boreholes SP05-87, SP07-87, SP11-87, and SP15-87 at levels significantly above the three times background standards arbitrarily selected by RFP. Chromium levels in boreholes SP06-87 and SP12-87 were also above the RFP standard, and nickel levels for boreholes SP05-87, SP07-87, SP11-87, and SP15-87 were also significantly elevated. These elevated nickel and chromium levels were generally associated with other elevated metals such as copper and zinc. Explain the elevated findings at borehole SP11-87 and the elevated concentration at deeper levels of SP05-87 and SP07-87 (approximately 9-23 feet). The analytical results from SP05-87, SP06-87, and SP07-87 are associated with the solar ponds, and SP12-87 and SP15-87 are downgradient from the solar ponds. Explain how these analytical results justify the elimination of chromium and nickel from closure performance standards.

The further analysis of Interceptor Trench Pump House (ITPH) ground water and the ground water collected from bedrock wells placed in 1987 must be considered in conjunction with soil data, and presented prior to eliminating chromium and nickel from consideration.

RESPONSE TO COMMENT #17

Elevated nickel and chromium occur at or near the water table in the site and downgradient boreholes at the Solar Ponds identified in this comment. This may indicate a release of nickel and chromium from the Solar Ponds that occurred in the past. Currently ground water does not contain elevated nickel and chromium. The location of the cap is in compliance with the closure regulation for surface impoundments [40 CFR 265.228(a)(2)(iii)] which states the impoundment must be covered. The closure performance standard is met because closure includes ground water corrective action to meet the ground water protection standard at the point of compliance. DOE has proposed a risk assessment-based closure for soil remediation that would define contaminant levels in soils that are protective of human health and the environment. Removal or remediation of soils to these levels would allow "clean" closure without capping and institutional controls. The results of the risk assessment would allow evaluation of whether the nickel and chromium soil concentrations posed unacceptable risk in the absence of a cap and institutional controls.

COMMENT #18

According to Appendix 6, page 4-26, "strontium is not considered a contaminant of soils in the solar ponds area." Before strontium is dismissed as a potential contaminant, strontium levels must be re-evaluated after further data have been collected and the background level for strontium in soils at the RFP has been established. Comparing the analytical data for strontium in soils with the average of all the samples analyzed and presented in Appendix C-1 reveals that boreholes SP02-87, SP04-87, and SP06-87 apparently contain soils which are considerably higher in strontium concentrations than the average value for all samples in Appendix C-1 (approximately 57 mg/kg). The levels found in the soil samples of these boreholes appear to be associated with the solar ponds and must be explained. To rely solely on cited references for average soil strontium levels is not acceptable, especially given the historical presence of strontium within the solar pond liquids.

RESPONSE TO COMMENT #18

As mentioned, Rockwell is implementing a background characterization plan to determine if strontium concentrations in soils at the Solar Ponds likely represent contamination. It is noted, however, that the "dirty" closure proposed in the July 1988 Closure Plan is in compliance with the regulations, i.e., there is no requirement for contaminated soils removal provided the surface impoundment is closed as a landfill [40 CFR 265.228(a)(2)]. See comment 17 regarding a risk assessment-based "clean" closure that could be implemented.

COMMENT #19

Appendix 6, page 4-29, again defines "20 pCi/gm of transuranics as the limit above which soil removal is necessary." This statement is similar to Sections 2.6.1, 2.6.1.2, and 2.6.1.3 of the closure plan text. The soil standard as defined by the State of Colorado for plutonium is 0.9 pCi/gm. This value is considerably lower than the proposed removal standard of 20 pCi/gm above which soil removal at the solar ponds would be required. The analyses for boreholes SP01-87, SP04-87, SP05-87, SP07-87, SP10-87, and SP16-87 all contain transuranic activity levels above the CDH standard.

Since 0.9 pCi/gm is the maximum permissible value, and the removal standard is actually ALARA-based, a significant increase in predicted soil removal volume may be required.

Page 4-27 indicates that all measured uranium concentrations were "within a factor of three of the upper background concentrations." This "factor of three" is irrelevant in indicating the presence of contamination, and in triggering removal decisions, because background levels have not been accurately established.

RESPONSE TO COMMENT #19

The value of 20 pCi/gm is an EPA guidance concentration considered protective of human health under uncontrolled conditions. Removal of soils to achieve this level of transuranics was considered a method to render contaminated soils left in place as not radioactive. The use of the more stringent State of Colorado standard is not applicable to a "dirty" closure. It may be applicable to a "clean" closure where capping and institutional controls are not required. In the latter case, the choice of the standard to be achieved must yet be resolved between DOE and the regulatory agencies.

We agree a background soils characterization is required to determine if uranium concentrations in soils represent contamination. This characterization program is underway. However, the need to remove uranium contaminated soils may be irrelevant in a "dirty" closure, but would have application for a "clean" closure as described in Response to Comment 17.

COMMENT #20

Although the soils data presented in Appendix 6, Table 4-9, for potential organic contamination are difficult to interpret due to sample mishandling and the lack of laboratory blanks, the compounds found at low concentration within the soil samples were also found in the ground water. Well 22-86 has been indicative of high levels of VOC contamination, and the contaminants found in the ground water from well 22-86 are also found in soils associated with the solar ponds. Explain how the exceedance of sample holding times, the failure to analyze lab blanks for the 1987 borings, and the complete absence of analyses from boreholes SP03-87, SP05-87, SP07-87, SP12-87, SP13-87, SP14-87, SP15-87, and SP16-87 allow for the conclusion that "organic contamination, although possible, is not of major significance at the solar ponds."

The HNu and OVA readings on some 1987 cores are elevated, indicating the potential presence of organics in the downgradient soils. Preliminarily, an organic source appears to be present near well 22-86. This source may be related to the location of the original solar ponds which were removed in 1970. Although the extent of soil contamination is not presently discernible from the existing data, the mishandling of the soil samples from the 1987 borings requires that further analysis of the soils be conducted before organic contamination in the solar pond vicinity is dismissed.

RESPONSE TO COMMENT #20

If the "dirty" closure as described in the July 1988 closure plan is implemented, further characterization of organic contaminants in the soil is unnecessary. If the "clean" closure described in Response to Comment 17 is implemented, a much more thorough characterization of organics in soils will be required. The characterization would be conducted under strict adherence to a sampling plan and Quality Assurance/Quality Control Plan prepared for the study so that meaningful validated data is collected. To date, HNu and OVA readings on cores have not correlated with the presence of Target Compound List volatile organics in the soil samples at any location at Rocky Flats.

COMMENT #21

According to Appendix 6, Section 5.2.1.3, horizontal ground-water flow velocity for the North Walnut Creek valley fill alluvium is estimated at 1.5 ft/yr, based on a hydraulic conductivity of 4.6 ft/yr. However, the velocity values estimated by Hurr (1976) range from 2,500 to 6,500 ft/yr. Hydraulic conductivity values ranging from $4x10^{-8}$ cm/sec (.04 ft/yr) to $8.7x10^{-6}$ cm/sec (9 ft/yr) are unrealistic given the lithologies shown in Table 5.1 and the measured hydraulic conductivity values at other plant locations. More accurate and more extensive characterization of hydraulic conductivity must be performed in the solar pond vicinity. If the original solar pond was placed in service in 1956, and ground water moves at 1.5 ft/yr, explain the high nitrate levels present in the soil at boreholes SP12-87 and SP14-87. These boreholes are approximately 700 feet downgradient from the solar ponds. Other constituents are also elevated in various boreholes, such as U233 and U238 levels in boreholes SP12-87, SP13-87, and SP15-87. Since the contamination in alluvial well 12-86 is likely associated with the solar ponds, the discrepancy between Hurr's estimate and the RFP velocity value of 1.5 ft/yr must be explained.

RESPONSE TO COMMENT #21

Hurr's values are only estimates based on lithologies. Values presented in the characterization report are based on site-specific tests. The characterization report states, "These values are low with respect to those at other locations at the Plant, and additional testing is needed to further characterize hydraulic conductivity values in the vicinity of the solar ponds" page 5-14 of characterization report.) The velocity of 1.5 ft/yr is based on the test of 17-86 in Q_{VF} of North Walnut Creek, a valley fill gradient of 0.03, and assumed effective porosity of 0.1. This gradient does not apply to colluvial materials on hillslope north of solar ponds where SP12-87 and SP14-87 are located. Overland flow of ground water on the hillslope may explain soils "contamination" in these boreholes.

12-86 is located downstream of the Solar Ponds in North Walnut Creek drainage between ponds B-2 and B-3. Another possible source of contamination are the B-ponds.

COMMENT #22

Section 5.2.1.5, page 5-34, states that "the downgradient extent of this 'plume' is unknown but within plant boundaries, as well as 4-86, located at Indiana Street, has always been dry." Because the alluvial system is most likely intimately connected with the surface water flow of North Walnut Creek, contaminants may leave the plant site as surface flow. Therefore, the statement that the "plume" extent lies within plant boundaries must be justified. A dry well does not monitor ground water.

RESPONSE TO COMMENT #22

The text should be reworded to state that there is no evidence that the ground-water "plume" extends off Rocky Flats Plant property. Such a condition is unlikely considering well 4-86 has always been dry; however, the possibility of surface water transport of some contamination cannot be ruled out.

COMMENT #23

Well 30-86 has been impacted by contamination originating from the solar ponds and is located approximately 150 feet from the nearest upgradient solar pond. Section 5.2.2.3, page 5-40, indicates that the calculated ground-water flow velocity for sandstone, siltstone, and claystone is 0.3, 0.3, and 0.4 ft/yr, respectively. If the solar ponds had been in use since 1956, ground water could have flowed at most approximately 13 feet. Explain the discrepancy. Plume extent must be delineated by actual well placement and ground-water characterization as opposed to the use of estimates of plume extent.

RESPONSE TO COMMENT #23

The calculation may be of little value considering the known overland flow of seepage in this area that would move contaminants downgradient faster than via ground-water flow (30-86 is a shallow well in subcropping weathered claystone). We agree actual well placements are necessary to delineate the extent of the plume.

COMMENT #24

Section 5.2.2.4, page 5-51, states that "the deep bedrock sandstone ground water is not impacted by the solar ponds or other possible upgradient SWMUs." However, bedrock well 30-86 (total depth of 16 ft) is dramatically impacted by contamination (radionuclides, metals, and inorganics) originating from the solar ponds. The occurrence of elevated levels of these same constituents cannot be dismissed as natural variability, but must be considered as emanating from the upgradient solar ponds. Further investigation is required to fully characterize the nature and extent of contamination within the deep sandstone.

RESPONSE TO COMMENT #24

Well 30-86 is a shallow well completed in subcropping weathered claystone. There is no question as to contamination at this location and depth. The text refers to sandstones 80 to 100 feet deep.

COMMENT #25

Surface water samples from North Walnut Creek must be taken monthly to evaluate the high flow and low flow conditions and the corresponding constituent concentrations. The inter-connection between the alluvial system and the North Walnut Creek surface water system would be most pronounced and documentable during the wet seasons when flow is higher.

RESPONSE TO COMMENT #25

We agree. Plans are in preparation to characterize surface water hydrology and contaminant transport for the entire plant site.